Public Abstract

First Name:Dante
Middle Name:Orlandis
Last Name:Smith
Adviser's First Name:Robert
Adviser's Last Name:Sharp
Co-Adviser's First Name:
Co-Adviser's Last Name:

Graduation Term:SP 2011
Department:Plant, Insect and Microbial Sciences
Degree:MS

Title:Abscisic Acid, Interactions with ethylene and reactive oxygen species in the regulation of root growth under water deficit.

Interactions between the hormones abscisic acid (ABA) and ethylene are involved in several responses to plant water deficits, including root growth regulation (Sharp, 2002). Furthermore, both hormones interact with the production of reactive oxygen species (ROS) (Kwak et al., 2006). ROS, including superoxide, hydroxyl radicals, and hydrogen peroxide, are highly reactive molecules that are often produced at excess levels during stressful conditions, and can be highly damaging to cellular structure and function (Ahmad et al., 2008). The interactions between ABA, ethylene, ROS and root growth are illustrated by the ABA-deficient maize mutant viviparous 14 (vp14). ABA-deficient seedlings exhibit impaired root growth during water deficits, and this was shown to be associated with excess production of ethylene (Spollen et al., 2000). Additional research showed that ABA-deficiency also leads to dramatically increased intracellular ROS levels in the root elongation zone, resulting in loss in membrane integrity and, ultimately, cell death (Cho, Sivaguru and Sharp, unpublished). To determine whether the increase in ethylene in ABA-deficient roots results in, or is the result of, the increase in ROS, a hydroponic culture system (Verslues et al., 1998) is being used to allow controlled application of inhibitors of ethylene synthesis during the growth of ABA-deficient roots at low water potentials. The results show that inhibition of ethylene synthesis prevents the increase in ROS levels, indicating that the interaction of ABA and ethylene is upstream of the production of ROS. Further analysis with this system will lead to a greater understanding of the signal transduction pathway and primary mechanisms involved in the regulation of root growth by ABA during water deficit conditions.